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SCIENTIFIC RESEARCH ON PAPAVER SPECIES

AS SOURCES OF CODEINE, MORPHINE AND THEBAINE */

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INSECTS INFESTING PAPAVER SPECIES IN SPAIN

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Note by the Secretariat

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INTRODUCTION

1. With few exceptions, micro-organisms causing infections in plants, once introduced, can be eliminated only by the destruction of the infected host. Consequently, preventive methods and procedures designed to keep plants free of infection are of the utmost importance from the practical point of view.

2. A large number of insects are responsible for transmitting diseases which can eventually destroy entire crops. The causal agents of such diseases are conveyed by insects which introduce them when they penetrate or settle on the plants, or transmit them by means of their mouth parts or ovipositors.

3. The transmitting action of the insects can be classified as persistent or non-persistent, defined as follows:

Persistent: when the insect has to spend a long period on the diseased host in order to acquire the disease-causing micro-organism or when a period of incubation in the insect is required, the micro-organism being subsequently transmitted by the insect after a lengthy period.

Non-persistent: when an insect can pick up the micro-organism (virus, bacteria, fungus) immediately and transmit it forthwith, or within a short period of time, simply by inserting its styli into the susceptible host.

4. The most detailed information possible must therefore be obtained about the disease carriers which attack Papaver if they are to be controlled and the spread of diseases prevented.

INSECTS WHICH ATTACK THE PAPAVER SPECIES

5. In order to carry out a systematic study of the various insects which can cause damage during the development of the poppy, we first drew a distinction between those attacking the capsule and those attacking the rest of the plant.

6. Thus far, we have been able to identify a number of species which attach the capsules before they reach maturity, and another genus which attacks them when they have matured and reached the stage of dehiscence, by entering through the orifices.

7. The insect attacks the immature capsule with its ovipositor, which produces a lesion in the wall of the capsule. If the poppy is of the P. rhoeas species, this results in a circular orifice, while in capsules of the P. somniferum species, it produces an outflow of latex, so that the opening becomes completely blocked and the capsule appears dotted with solid concretions which are simply small quantities of opium. The eggs of the species in question are deposited inside the capsules. We shall endeavour later to trace the life cycle of the insect by studying the larva, during which phase nymphs can be observed at various stages of development.

8. As the capsule matures, these parasites develop within it until they reach the adult stage, although occasionally they are parasitized by other insects within the capsules.

Green capsule	Aulax Pseudotorymus Oryssus
Dry capsule	Oxycarenus

Hymenoptera

Genus Aulax

9. This genus belongs to the family Cynipidae - small and drab insects of which there are some 2,000 known species. In general, the members of this family are herbivorous, creating galls on the infested plants. These galls are so characteristic of each species that, in most cases, it is easier to identify the insect by the plant and the gall than by the imago.

10. The relationship between the plant and the gall-producing insect is still by no means clearly established, particularly as regards why the plant responds to the stimulus provided by the young larva in a very specific way by forming an excrescence which is always of the same type. The species which we found belonging to this family is Aulax papaveris.

Genus Pseudotorymus

11. Another of the insects which we identified as infesting Papaver capsules is a species of this genus belonging to the family Chalcididae.

12. In general, insects belonging to this family are small, and are blue, green or iridescent. Classification is complicated by the large number of insects belonging to the family.

13. In a study of the literature, we were unable to find information on any species of this genus which was a parasite of Papaver. It was therefore tentatively named Pseudotorymus papaveris. The female of the species differs very markedly from the male, being larger, with a more compressed abdomen. The ovipositor is relatively large. This insect appears capable of parasitizing the larvae of other insects.

Genus Oryssus

14. This genus belongs to the family of Oryssidae, which are exceptionally rare insects throughout Europe. The species identified by us is O. gratiosus. In the entomological works consulted, it is not mentioned as infesting Papaver, so that this discovery could be of importance.

15. It is probable that this parasite does not itself infest the capsules and it may be a parasite of one or both of the other two species described above. Consequently, this species could be of interest, not only from the point of view of poppy cultivation, but also for possible use as a biological control, should that prove necessary.

Hemiptera

Genus Oxycarenus

16. These insects belong to the Lygaeidae family and are popularly known as "chinch bugs". They generally feed on the sap of plants. The species which we identified in the genus Papaver - Oxycarenus paliata - can infest only dehiscent species, since it enters the capsules when they have reached

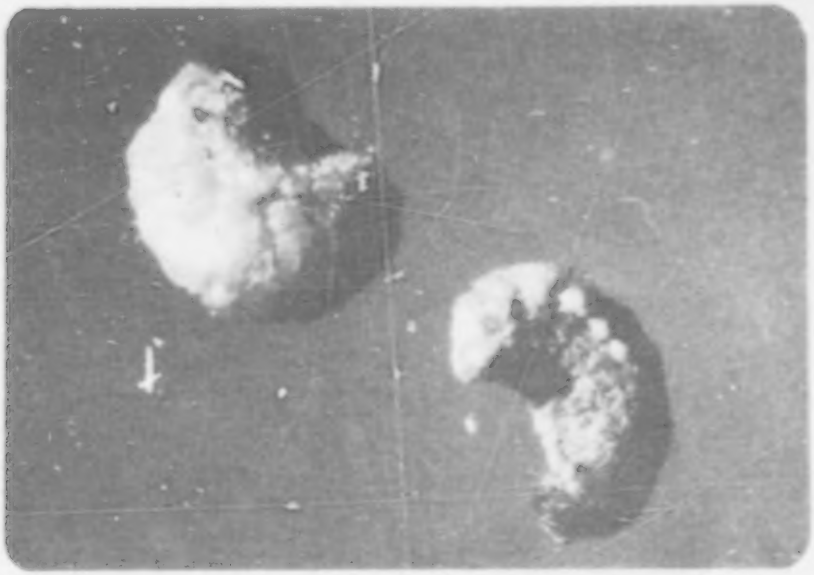
maturity. It enters through the orifices and establishes itself inside the capsule, which it uses as a refuge and place of reproduction, while feeding on the seeds of the plant.

17. We have established that the larvae develop inside the capsule and that the resulting nymphs feed on the seeds: they already have the form of adults, but can easily be distinguished from them by their colouring, which is white with red borders. Inside the capsule, the whole family is protected from attack by arachnids, which are their natural predators.

18. Throughout the winter we have carried out inspections of capsules which have been identified as being infested by O. paliata, finding some specimens in a state of hibernation, which indicates that their life cycle is simple and takes place in one and the same plant.

ILLUSTRATIONS

1. POPPY CAPSULE ATTACKED BY INSECTS



2. AULAX PAPAVERIS LARVAE

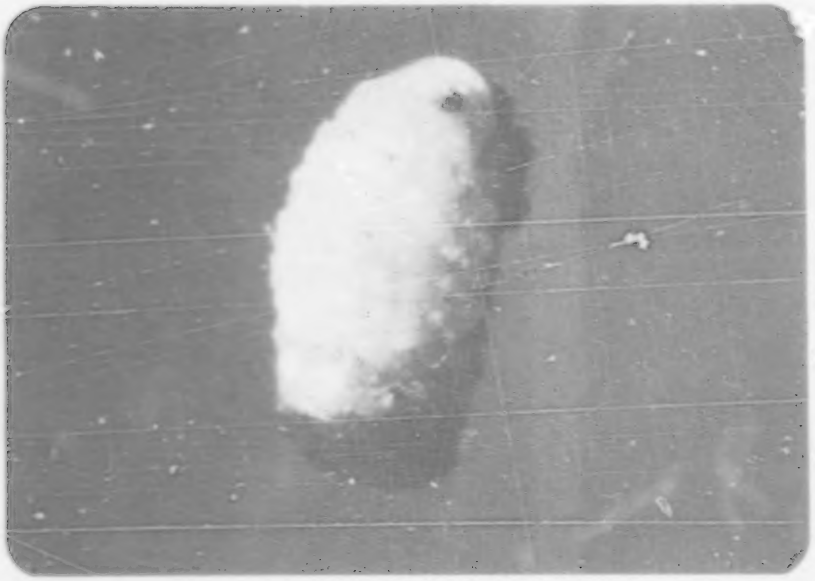
3. AULAX PAPAVERIS NYMPH

4. AULAX PAPAVERIS ADULT

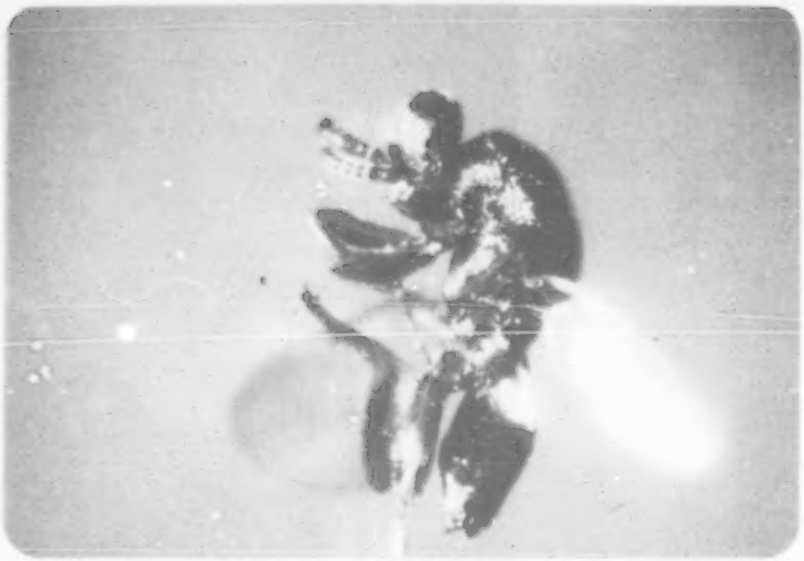
5. AULAX PAPAVERIS ADULT

GENUS PSEUDOTORYMUS

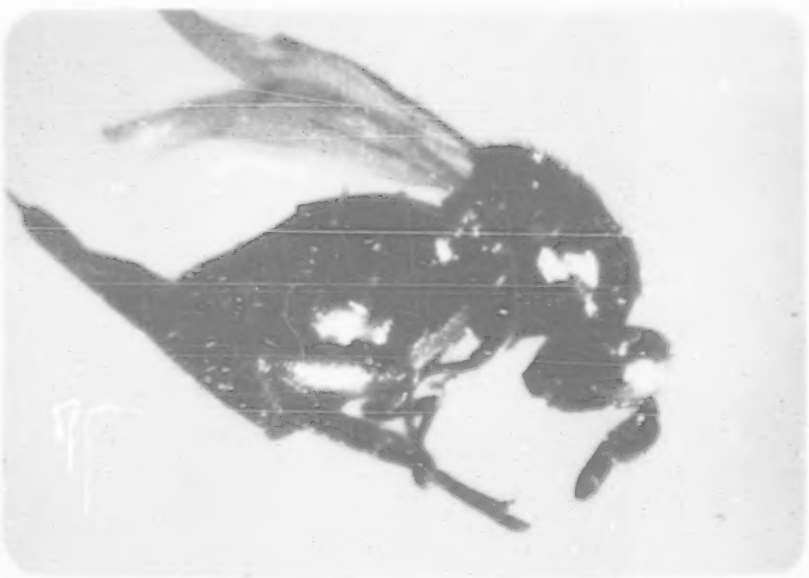
6. PSEUDOTORYMUS PAPAVERIS LARVA



7. PSEUDOTORYMUS PAPAVERIS LARVA



8. PSEUDOTORYMUS PAPAVERIS ADULT



9. PSEUDOTORYMUS PAPAVERIS ADULT

10. PSEUDOTORYMUS PAPAVERIS ADULT

11. PSEUDOTORYMUS PAPAVERIS ADULT

GENUS ORYSSUS

12. ORYSSUS GRATIOSUS ADULT

13. ORYSSUS GRATIOSUS ADULT

GENUS OXYCARENUS

14. OXYCARENUS PALIATA ADULT

15. OXYCARENUS PALIATA ADULT